

**SOAH DOCKET NO. 582-22-0844
TCEQ DOCKET NO. 2021-1000-MSW**

IN THE MATTER OF THE APPLICATION BY DIAMOND BACK RECYCLING AND SANITARY LANDFILL, LP FOR MSW PERMIT NO. 2404	§ § § § §	BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS
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PREFILED TESTIMONY OF LAWRENCE DUNBAR, P.E.

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LIST OF EXHIBITS

Knox-200	Prefiled Testimony of Lawrence G. Dunbar, P.E.
Knox-201	Resume of Lawrence G. Dunbar
Knox-202	Figure 1 – Application Figure III.C1.1 with Notations
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PREFILED TESTIMONY OF LAWRENCE G. DUNBAR

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME.

A. Lawrence G. Dunbar.

Q. PLEASE STATE YOUR ADDRESS.

A. 6342 Dew Bridge Dr., Sugar Land, TX 77479.

Q. BRIEFLY DESCRIBE YOUR OCCUPATION.

A. I am currently a practicing engineer in the area of water resource/environmental engineering as well as a practicing attorney in the area of environmental, water and drainage law.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND.

A. I graduated with a B.S. in Civil Engineering from the University of Notre Dame in 1975. In 1981 I graduated from the Illinois Institute of Technology with a Master's degree in Environmental Engineering. In 1988, I obtained my J.D. from the University of Houston Law Center.

Q. WHAT PRACTICAL ENGINEERING EXPERIENCE HAVE YOU HAD SINCE RECEIVING YOUR ENGINEERING DEGREES?

A. I began working in 1975 for the U.S. Army Corps of Engineers, Chicago District, and spent almost six years in its Hydrology and Hydraulics Branch, eventually becoming head of its Flood Control and Reservoir Regulation Section. I stayed at the Corps until 1982 when I joined Keifer Engineering, Inc. where I worked in their Water Resources Group. In 1983, I worked for Espey, Huston & Associates in Austin, Texas in the Hydrology/Hydraulics Group. From 1984 to 1985, I worked as a staff engineer for the State of Indiana (at the Indiana Board of Health, Land

1 Pollution Control Division in their Engineering Department), reviewing hazardous
2 waste landfill applications, and at the Department of Water Resources in their
3 Dam/Lake Section. I worked for Espey, Huston & Associates, Inc. in Houston,
4 Texas from 1986 until 1988 assisting with the drainage design of the final cover of
5 a chemical waste landfill, as the company's senior water resources engineer/group
6 leader. From 1988 until the present, I have worked as a private consultant on my
7 own as a water resources and environmental engineer.

8 **Q. WHAT TYPE OF WORK HAVE YOU DONE IN THE WATER**
9 **RESOURCES AND ENVIRONMENTAL ENGINEERING FIELD?**

10 **A.** As I mentioned above, for over 45 years I have worked in both the public and
11 private sector. In the area of drainage and/or detention pond analyses, I have
12 conducted or reviewed over one hundred such analyses, including more than a
13 dozen associated with the design of landfills, for both protestants and applicants. I
14 have been a technical consultant to various governmental agencies, developers,
15 engineering firms and law firms regarding flooding, floodplain and drainage
16 issues, and have developed drainage and/or detention criteria for regulatory
17 agencies.

18 **Q. HAVE YOU EVER TESTIFIED AS A DRAINAGE AND/OR FLOODING**
19 **EXPERT IN A TCEQ, FORMERLY TNRCC, LANDFILL PERMIT**
20 **HEARING?**

21 **A.** Yes. I have testified on behalf of protestants regarding a number of landfill permit
22 applications, including the Skyline, Spring Cypress, Blue Flats, North Texas 121,
23 Juliff Gardens, Tan Terra, IESI in Jack County, and Ponderosa landfill permit
24 applications.

1 **Q. HAVE YOU EVER REVIEWED THE DRAINAGE AND/OR DETENTION**
2 **POND ANALYSES CONTAINED IN LANDFILL PERMIT APPLICATIONS**
3 **ON BEHALF OF AN APPLICANT?**

4 **A.** Yes, for more than a dozen such applications generally doing quality assurance
5 and quality control ("QA/QC") type review for the applicant or its attorney.

6 **Q. ARE YOU A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF**
7 **TEXAS?**

8 **A.** Yes, I have been licensed to practice as a professional engineer in Texas since
9 1983.

10 **Q. AS A PRACTICING ATTORNEY, WHAT TYPE OF EXPERIENCE DO**
11 **YOU HAVE IN RELATION TO MUNICIPAL SOLID WASTE LANDFILL**
12 **APPLICATIONS?**

13 **A.** I have represented protesting parties in contested case hearings regarding the
14 expansion of existing landfills in central Texas.

15 **Q. CAN YOU IDENTIFY WHAT HAS BEEN MARKED AS KNOX-201?**

16 **A.** Yes. This exhibit is a representative resume summarizing my experience in various
17 areas of practice.

18 **Q. IS THIS A TRUE AND ACCURATE COPY OF YOUR RESUME?**

19 **A.** Yes.

20 ***KNOX OFFERS EXHIBIT KNOX-201.***

21 **II. SUMMARY OF OPINIONS**

22 **Q. HAVE YOU DEVELOPED OPINIONS REGARDING THE APPLICATION**
23 **THAT IS THE SUBJECT OF THIS PROCEEDING?**

24 **A.** Yes.

25 **Q. ON WHAT TOPICS HAVE YOU DEVELOPED OPINIONS?**

26 **A.** I have reviewed the portions of the application that address surface water
27 hydrology and proposed drainage structures.

1 **Q. PLEASE PROVIDE A BRIEF SUMMARY OF YOUR OPINIONS.**

2 **A.** First, the Applicant's characterization and calculation of existing drainage
3 conditions/flow patterns are unreliable and inadequate. For instance, the manner in
4 which the peak flows for existing conditions were identified by the Applicant as
5 exiting the site at specific discharge/comparison points does not accurately or
6 reliably reflect the type of surface water flow that currently exists at the site. The
7 existing surface water flow leaving the site is via sheet flow all along the perimeter
8 of the site, rather than at specific discharge points. But the Applicant failed to
9 account for this, and instead assumed the site's existing surface water runoff leaves
10 the site at specific discharge points when comparing existing conditions to post-
11 developed conditions (for which some does leave the site at specific points such as
12 at Points A and B, after exiting the proposed North and South detention ponds,
13 respectively). This renders the Applicant's comparison of existing conditions and
14 proposed/post-developed conditions (after the landfill is developed) unreliable.
15 Doing the correct comparison shows that the Applicant's computed peak flow
16 rates leaving the site at these two pond discharge locations are actually 10 to 20
17 times higher than what is occurring at those locations under existing conditions.
18 Therefore, Applicant is unable to demonstrate that post-developed conditions will
19 not result in significant adverse impacts to natural, existing drainage patterns.

20 Second, the Applicant has failed to demonstrate that the proposed detention
21 ponds are adequately sized and designed, based on appropriate engineering
22 methods, to detain run-off so that it does not adversely impact natural drainage

1 patterns, at the permit boundary and downstream. In fact, the Applicant utilizes an
2 unreferenced method (i.e., Modified Rational Method) to establish the size of the
3 proposed detention ponds; yet the resulting pond capacity is so small that it will
4 fill up before the post-developed peak flows enter the pond, thus providing no
5 reduction in the post-development peak flows that are supposed to be reduced to
6 the existing/pre-development peak flows. These undersized detention ponds result
7 in the proposed peak flow rates being much higher than what the Applicant shows
8 in its permit application, leading to an even greater adverse impact to downstream
9 property.

10 As a consequence of the above-described deficiencies, the application fails
11 to comply with TCEQ Rule 330.63(c)(1) and with Subchapter G of the TCEQ
12 Chapter 330 rules, and the Applicant has failed to verify that existing drainage
13 patterns will not be adversely altered.

14 **Q. WHAT MATERIALS HAVE YOU REVIEWED TO DEVELOP THESE**
15 **OPINIONS?**

16 **A.** I have reviewed the initial application submitted by Diamond Back to TCEQ,
17 along with the various Notice of Deficiency letters and Responses to those letters.
18 Those are all the materials that the Applicant has provided, in response to
19 discovery requests asking for materials that support their drainage analysis and
20 report.

21 I also reviewed the photos of the site that were taken by Dr. Jorge Zornberg,
22 and his description of the locations of each photographed area.

1 **Q. WHAT RULES AND/OR GUIDANCE DOCUMENTS HAVE YOU**
2 **REVIEWED TO DEVELOP THESE OPINIONS?**

3 **A.** TCEQ Rule 330.63(c)(1) and Subchapter G of the TCEQ rules. I have also
4 reviewed the TCEQ's Regulatory Guidance (RG-417) regarding how to perform
5 the drainage analyses for municipal landfill permit applications.

6 **III. COMPARISON OF EXISTING DRAINAGE CONDITIONS TO POST-**
7 **DEVELOPMENT DRAINAGE CONDITIONS**

8 **Q. LET'S START WITH YOUR FIRST OPINION. WHAT DO THE RULES**
9 **REQUIRE REGARDING IMPACTS ON SURFACE WATER DRAINAGE**
10 **PATTERNS?**

11 **A.** Rule 330.305(a) requires that existing drainage patterns must not be adversely
12 altered. So, an applicant must compare existing surface water drainage conditions
13 with the proposed post-development/landfill drainage conditions to ensure that
14 existing drainage patterns are not going to be adversely altered as a result of the
15 construction and operation of the proposed landfill. Typically, an applicant looks at
16 the velocity, peak flow rate, and volume of surface water runoff, as it exits the site,
17 during a design storm event, for existing conditions and compares those values to
18 the velocity, peak flow rate, and volume of surface water discharges under the
19 proposed post-development/landfill conditions to demonstrate that existing
20 drainage patterns will not be adversely altered.

21 **Q. IN YOUR OPINION, HAS THE APPLICANT MADE THIS**
22 **DEMONSTRATION?**

23 **A.** No.

24 **Q. WHAT IS THE BASIS FOR YOUR OPINION?**

25 **A.** First, it's unclear how the velocity associated with the peak flow was calculated by
26 the Applicant for existing conditions at each of the 5 Discharge Points (A, B, C, D

1 and E) where the Applicant represents that surface water runoff leaves the site.
2 Based on the photos that I reviewed, the topographic information in the
3 application, and even the narrative description in the application, the existing
4 drainage condition can be described as sheet flow. That is, there is no defined
5 discharge route or discharge point by which surface water drains off the site, under
6 existing conditions. This runoff is generally leaving the site all along the permit
7 boundary of the site. Exhibit Knox-202 illustrates how surface water is leaving the
8 site under existing conditions from Drainage Areas A and B all along the permit
9 boundary. This is not accounted for in identifying and locating the peak flows for
10 existing conditions by the Applicant.

11 Instead, existing conditions are reflected as discharging at a single point for
12 each of the 5 drainage areas, in the application, designated as Comparison Points.
13 This means that the peak flows for existing conditions computed for the 5 drainage
14 areas by the Applicant are being assigned as the peak flow that is occurring at each
15 of the 5 discharge points; but in reality, those peak flows are spread out all along
16 the permit boundary.

17 In addition, the velocity of the peak flows for existing conditions is also
18 likely overestimated; the velocity is likely much lower, under existing conditions,
19 than what is reflected in the application, because surface water is not discharging
20 via a single drainage channel at a single discharge point, but rather, is draining
21 slowly, via sheet flow. Furthermore, the Applicant has failed to provide any
22 calculations demonstrating how the stated velocities at the 5 discharge points for

1 existing conditions were determined for the specified peak flows.

2 Under the post-development/landfill conditions, the calculation of the
3 velocity of the computed peak flows at Discharge Points C, D and E is also not
4 provided in the application. However, there is a calculation of the peak flow
5 velocity overflowing the weirs at the 2 detention ponds. This is expected for the 2
6 large discharge points (A and B), as the landfill design proposes to route the
7 surface water to the eastern perimeter of the site to its two proposed detention
8 ponds where it will be discharged over weirs at these two points. But Applicant
9 cannot accurately or reliably compare peak flow velocity for these two discharge
10 points from the proposed detention ponds to the peak flow velocity for existing
11 conditions at the eastern perimeter boundary because Applicant has not properly
12 accounted for how surface water runoff exits the site along the eastern boundary
13 under existing conditions, and thus, its peak flow velocities for existing conditions
14 at these two points is an overestimation.

15 In sum, the problem with the Applicant's analysis is that one cannot reliably
16 or accurately calculate impacts of the proposed landfill project on existing
17 drainage patterns, because the peaks flows and velocity for existing conditions as
18 specified at the 5 discharge points are inaccurate; they are overestimations of what
19 is really happening at the permit boundary under existing conditions.

20 **Q. YOU REFERRED TO EXHIBIT KNOX-202, WHICH YOU DESCRIBED**
21 **AS ILLUSTRATING HOW SURFACE WATER RUNOFF LEAVES THE**
22 **SITE UNDER EXISTING CONDITIONS. IS THIS AN EXHIBIT THAT**
23 **YOU PREPARED?**

1 A. Not exactly. This figure was included in the application. I simply added the
2 various black arrows crossing the permit boundary to emphasize the direction of
3 the flow of surface water for Drainage Areas A and B, based on the topography as
4 shown on this figure.

5 ***KNOX OFFERS EXHIBIT KNOX-202.***

6 **Q. WHAT IS EXHIBIT KNOX-203?**

7 A. This is another figure taken from the application. This illustrates how surface
8 water will be routed and discharged from the site under post-development/landfill
9 conditions. This figure also illustrates the two detention ponds that are proposed at
10 the eastern boundary of the site, where they will discharge surface water at the two
11 weirs located at the two black arrows I placed on this figure from the application.

12 ***KNOX OFFERS EXHIBIT KNOX-203.***

13 **Q. ARE PEAK FLOWS AND VELOCITY THE ONLY THINGS THAT ONE**
14 **LOOKS AT TO DETERMINE WHETHER THE LANDFILL WILL**
15 **ADVERSELY IMPACT EXISTING DRAINAGE PATTERNS?**

16 A. No. Volumes of surface runoff and the timing of flows are also important factors to
17 be considered. some of these are off too when compared to existing conditions.
18 For example, the volume of runoff at discharge point A under post-
19 development/landfill conditions will increase by over 50% of the existing runoff
20 volume, as computed by the Applicant, which will also have an adverse impact on
21 downstream property. This increase in runoff volume will be even greater when
22 compared to the correct runoff volume for existing conditions that is actually
23 occurring at this discharge point.

1 **Q. DO YOU HAVE AN OPINION AS TO WHETHER THERE WILL BE AN**
2 **ADVERSE ALTERATION OF EXISTING DRAINAGE PATTERNS?**

3 **A.** Yes. My opinion is that had an accurate representation of drainage patterns for
4 existing conditions been used for the comparison with proposed post-
5 development/landfill conditions, we would have seen that the landfill will have an
6 adverse impact on existing drainage patterns.

7 **Q. WHAT IS THE BASIS FOR YOUR OPINION?**

8 **A.** I did a calculation above as to the peak flow rate at Discharge Point B across the
9 71-foot wide area along the permit boundary for existing conditions (less than 5
10 cfs) as compared to the proposed peak flow rate of 54 cfs at that same location
11 coming out of the South Pond under post-development/landfill conditions.
12 Likewise, the peak flow rate at Discharge Point A across the 86-foot wide area
13 along the permit boundary for existing conditions is also less than 5 cfs (closer to
14 3.5 cfs) as compared to the proposed peak flow rate of 65 cfs at that same location
15 coming out of the North Pond under post-development/landfill conditions. Both
16 of these comparisons indicate that there will be a significant increase in peak flow
17 rates at Discharge Points A and B under the proposed post-development/landfill
18 conditions.

19 **Q. IN YOUR OPINION, WOULD THIS ADVERSE ALTERATION OF**
20 **EXISTING CONDITIONS IMPACT ADJACENT LANDOWNERS?**

21 **A.** Yes. My opinion is that this would impact downstream land owners, such as the
22 property just east of the landfill site. That property is likely to see significantly
23 more surface water runoff during storm events at higher flow rates and more

erosion downstream along the flow paths leaving these two proposed detention pond discharge points.

Q. THE APPLICANT EXPLAINS IN THE APPLICATION MATERIALS THAT RUNOFF FLOWING OFFSITE TO THE EAST WILL BE MITIGATED BY TWO DETENTION PONDS. DOES THAT AFFECT YOUR OPINION REGARDING IMPACTS TO DOWNSTREAM PROPERTY?

A. Yes, in that the impacts will be even worse than those discussed above. This brings me to my second critique of the surface water drainage report, and that is that the detention ponds are not properly sized (i.e., they are too small).

IV. DETENTION PONDS ARE NOT PROPERLY SIZED

Q. PLEASE EXPLAIN THE BASIS FOR YOUR OPINION REGARDING THE SIZE OF THE DETENTION PONDS.

A. First, the Applicant relied on the “Modified Rational Method” to determine the size of the detention ponds. But it’s unclear why this method was used, what is its reference, or why it’s appropriate to use it here to design these two detention ponds. TCEQ rules do not reference this method, nor does the TCEQ guidance document RG-417. And there’s no citation to any resource or guidance document that recommends use of the Modified Rational Method. Also, I saw nothing in the application materials indicating that the Executive Director approved use of this method, which is typically required before an Applicant prepares and submits its permit application. So, that’s my first criticism.

Typically, I have seen use of the “rational method” for purposes of determining peak flow rates which the Applicant has done here. But that’s not all that the Applicant did in this case. It used a modification of this method in an

1 attempt to determine the appropriate size its two detention ponds.

2 Also, there is no hydrograph included in the application materials to see
3 how much and at what rates stormwater will run-off the landfill, enter these two
4 ponds, flow through the ponds and be discharged from these ponds as compared to
5 the existing conditions.

6 **Q. HOW DOES THIS INFORM YOUR OPINION REGARDING THE SIZE**
7 **OF THE DETENTION PONDS?**

8 **A.** There's nothing in the application materials to demonstrate that the detention
9 system can handle a 25-year/24-hour storm event, as required by TCEQ rules.
10 There is no analysis or hydrograph in the application materials demonstrating this.

11 **Q. DO YOU HAVE AN OPINION AS TO WHETHER THE DETENTION**
12 **PONDS ARE ADEQUATELY SIZED, EVEN THOUGH THERE ARE NO**
13 **CALCULATIONS IN THE APPLICATION TO REVIEW?**

14 **A.** Yes. My opinion is that the detention ponds are severely undersized. The basis for
15 my opinion, even though there is no analysis in the application, is that for the
16 North Pond, the size of the pond is designed for 5.7 acre-feet of water to be stored
17 for the 25-year, 24-hour storm. Yet this storm would yield about 35 acre-feet of
18 stormwater runoff from the 103.9 acres for Drainage Area A that would enter this
19 pond. There is no outlet culvert constantly discharging significant amounts of
20 water during the filling up of this pond. Instead, Applicant has proposed use of
21 gabion boxes, which are low-flow outlet structures to drain the pond, though no
22 outflow information is provided in the application. This means that the pond will
23 fill up and start overflowing the weir before the peak inflow of 177 cfs enters this
24 pond. There is not enough storage in this pond to reduce this peak inflow down to

1 the Applicant's calculated "existing conditions" peak flow rate of 65 cfs (based on
2 the Applicant's erroneous calculation), much less having to reduce this peak
3 inflow rate down to the actual existing conditions rate of about 3.5 cfs. One would
4 need about 3 times the size of this pond if the Applicant's existing conditions peak
5 flow rate were used, and about 6 times the size if the real existing conditions flow
6 rate is used. The same issue applies to the South Pond as well.

7 Exhibit Knox-204 is a hydrograph and summary explanation of what I have
8 just described above for both the North Pond and the South Pond.

9 **Q: DID YOU PREPARE EXHIBIT KNOX-204?**

10 **A.** Yes, I prepared this exhibit and included the narrative information in the exhibit,
11 based on the information I collected from the application materials and from
12 rainfall data I collected regarding the 25-year/24-hour storm event for the location
13 of the proposed landfill site.

14 ***KNOX OFFERS EXHIBIT KNOX-204.***

15 **Q. WHAT IS THE EXPECTED IMPACT OF HAVING UNDERSIZED**
16 **DETENTION PONDS?**

17 **A.** The peak flow rates being discharged from these two ponds will greatly exceed
18 existing peak flow rates and adversely alter existing drainage patterns, and
19 adversely impact downstream property via increased flood levels and duration,
20 and erosion.

21 **Q. WHAT IS THE PEAK FLOW RATE, AND WHY IS IT IMPORTANT THAT**
22 **PEAK FLOW RATE NOT BE EXCEEDED?**

23 **A.** Peak flow rate is the maximum rate that water is flowing at any time. It controls
24 the velocity that the water moves across the surface of the ground (as well as other

1 factors) and how high the water gets above the ground. Thus, the peak flow rate is
2 one of the most important factors that should not be exceeded when developing a
3 project, such as a landfill.

4 **V. CONCLUSION**

5 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

6 **A. Yes.**